No. 7. This, in one respect at least, is the most remarkable nebula I have ever seen. I doubt if the entire heavens afford a similar example. If the reader will cut off a short piece of fine, bright brass wire, and hold it up sidewise to the sky, he will form, by looking at it, a very correct idea of how it appeared to me. The line was certainly nebulous. It must be a thin nebulous disk seen exactly edgewise.

G. C. 383 does not exist, and must be struck out. Sir JOHN HERSCHEL makes both 380 and 383 of equal brightness, and the places given would place both well within my field of 31′ in diameter, power 132. I made a long and thorough search for 383, and would have found it if there, had it been three times fainter than 380, which is an easy object.

PLANETARY PHENOMENA FOR JANUARY AND FEBRUARY, 1898.

BY PROFESSOR MALCOLM MCNEILL.

JANUARY.

Eclipses. 1898 is richer in eclipses than was 1897. There will be six in all, divided equally between those of the Sun and those of the Moon, and one of each will occur in January.

The first will be *a partial eclipse of the Moon*, and will occur on January 7th. It will be visible in the eastern hemisphere and in the eastern part of the United States, but the Moon will have passed out of the Earth's shadow before moonrise in the western part of the United States. The maximum obscuration is less than one sixth of the Moon's diameter.

The second will be *a total eclipse of the Sun* on the morning of January 22d. No part of it will be visible in the western hemisphere. The line of totality begins in Central Africa, and passes through the Indian Ocean, India, and China. The most accessible part of the Earth for observations is India, and the weather conditions are usually favorable at that time of the year. A large number of expeditions from various parts of the world will be sent to make observations. The duration of the eclipse will be about two minutes.

Occultations. The Moon will pass over the *Pleiades*, and a considerable number of occultations may be seen from almost any part of the United States on the evening of January 30th.

Mercury is an evening star at the beginning of the month, setting not quite an hour after sunset. It rapidly approaches the Sun, passes inferior conjunction on January 6th, and becomes a morning star. By the middle of the month, it rises early enough to be seen in the morning twilight, and it reaches its greatest west elongation on the morning of January 29th, when it rises nearly an hour and a half before sunrise.

Venus is a morning star, quite near the Sun throughout the month, and cannot be seen, except, possibly, for a few days at the beginning. On January 31st it rises only a few minutes before sunrise.

Mars is also a morning star, very close to *Venus* at the beginning of the month, less than one degree west and north; but instead of getting nearer the Sun, as *Venus* does, it moves away from it, and at the end of the month it rises about an hour before sunrise. Its distance from the Earth has begun to diminish slightly, but not enough to cause much increase in brightness.

Jupiter rises at about midnight on January 1st, and two hours earlier on January 31st. It is a little east and south of the third magnitude star γ *Virginis*, and moves eastward about one degree until January 24th, when it begins to retrograde.

Saturn is a morning star, rising somewhat earlier than *Mars* and *Venus*. It is in the constellation *Scorpio*, about six degrees north of the red first magnitude star, *Antares*, and during the month moves about three degrees eastward.

Uranus precedes *Saturn* about six degrees, and is about one degree south of β *Scorpii*. It is also moving eastward, but less than half as fast as *Saturn*.

Neptune is in the eastern part of *Taurus*.

February.

Mercury is a morning star throughout the month, and during the first half of the month rises early enough to be seen in the morning twilight, if the atmospheric conditions are good. It makes a very near approach to *Mars* on February 11th, *Mercury* passing to the north of *Mars* at a distance of only one minute of arc. The Sun will have risen for all parts of the United States

before the time of the nearest approach, but the planets will be near enough to be seen together in a telescope with a moderately large field of view, on the morning of that date before sunrise.

Venus is a morning star at the beginning of the month, but passes superior conjunction on the morning of February 15th, and becomes an evening star. It does not, however, reach a distance from the Sun sufficient for naked-eye observation until some time after the end of February.

Mars is also a morning star, rising a little earlier than during January. It is slowly approaching the Earth, but it is still distant from us more than double the Earth's mean distance from the Sun, and it will not be conspicuous until nearly the close of the year.

Jupiter is rising about two hours earlier than during the corresponding time in January, and by the end of the month is up in time for late evening observations. It moves westward during the month about two degrees from a position east of the third magnitude star, γ *Virginis*, to a position about the same distance west. At the time of nearest approach, the star is a little more than one degree north of the planet.

Saturn is still a morning star, but rises earlier at the end of the month, shortly after one o'clock. It moves about two degrees eastward in the constellation *Scorpio*, and is north and east of the red star *Antares*, the brightest star of the constellation. The apparent outer minor axis of the ring is nearly half the major axis, not far from the widest opening the rings can have.

Uranus precedes *Saturn* about nine degrees, and is about one degree east and south of β *Scorpii*. Its motion during the month is small, about half a degree eastward, until February 28th; then it begins to retrograde.

Neptune is in the eastern part of *Taurus*, and remains above the horizon until after midnight.

Explanation of the Tables.

The phases of the Moon are given in Pacific Standard time. In the tables for Sun and planets, the second and third columns give the Right Ascension and Declination for Greenwich noon. The fifth column gives the local mean time for transit over the Greenwich meridian. To find the local mean time of transit for any other meridian, the time given in the table must be corrected by adding or subtracting the change per day, multiplied by

the fraction whose numerator is the longitude from Greenwich in hours, and whose denominator is 24. This correction is seldom much more than 1^m. To find the standard time for the phenomenon, correct the local mean time by *adding* the difference between standard and local time if the place is west of the standard meridian, and *subtracting* if east. The same rules apply to the fourth and sixth columns, which give the local mean times of rising and setting for the meridian of Greenwich. They are roughly computed for Lat. 40°, with the noon Declination and time of meridian transit, and are intended as only a rough guide. They may be in error by a minute or two for the given latitude, and for latitudes differing much from 40° they may be several minutes out.

PHASES OF THE MOON, P. S. T.

		H.	M.	
Full Moon,	Jan. 7,	4	24	P. M.
Last Quarter,	Jan. 15,	7	44	A. M.
New Moon,	Jan. 21,	11	25	P. M.
First Quarter,	Jan. 29,	6	33	A. M.

THE SUN.

1898.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Jan. 1.	18 49	— 22 59	7 27 A.M.	12 4 P.M.	4 41 P.M.
11.	19 32	— 21 46	7 26	12 8	4 50
21.	20 15	— 19 50	7 22	12 12	5 2
31.	20 57	— 17 17	7 14	12 14	5 14

MERCURY.

Jan. 1.	19 35	— 20 16	8 2 A.M.	12 50 P.M.	5 38 P.M.
11.	18 45	— 19 40	6 31	11 21 A.M.	4 11
21.	18 36	— 20 51	5 48	10 33	3 18
31.	19 12	— 21 47	5 47	10 29	3 11

VENUS.

Jan. 1.	18 1	— 23 27	6 41 A.M.	11 16 A.M.	3 51 P.M.
11.	18 56	— 23 13	6 56	11 32	4 8
21.	19 50	— 21 49	7 4	11 46	4 28
31.	20 43	— 19 19	7 8	12 0 M.	4 52

MARS.

Jan. 1.	17 58	— 24 4	6 41 A.M.	11 13 A.M.	3 45 P.M.
11.	18 31	— 23 58	6 35	11 7	3 39
21.	19 4	— 23 27	6 25	11 0	3 35
31.	19 37	— 22 29	6 15	10 54	3 33

JUPITER.

1898.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Jan. 1.	12 37	— 2 32	12 2 A.M.	5 53 A.M.	11 44 A.M.
11.	12 39	— 2 43	11 25 P.M.	5 16	11 7
21.	12 40	— 2 47	10 47	4 38	10 29
31.	12 40	— 2 43	10 7	3 58	9 49

SATURN.

Jan. 1.	16 24	— 19 53	4 51 A.M.	9 40 A.M.	2 29 P.M.
11.	16 29	— 20 2	4 16	9 5	1 54
21.	16 32	— 20 10	3 41	8 30	1 19
31.	16 36	— 20 16	3 6	7 54	12 42

URANUS.

Jan. 1.	15 59	— 20 21	4 26 A.M.	9 14 A.M.	2 2 P.M.
11.	16 1	— 20 27	3 50	8 37	1 24
21.	16 2	— 20 32	3 13	8 0	12 47
31.	16 4	— 20 36	2 35	7 22	12 9

NEPTUNE.

Jan. 1.	5 19	+ 21 44	3 15 P.M.	10 33 P.M.	5 51 A.M.
11.	5 19	+ 21 43	2 35	9 53	5 11
21.	5 17	+ 21 42	1 55	9 13	4 31
31.	5 17	+ 21 42	1 14	8 32	3 50

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

(Off left-hand limb, as seen in an inverting telescope.)

			H. M.				H. M.
II, D,	Jan.	2.	10 16 P. M.	II, D,	Jan.	17.	3 26 A. M.
I, D,		3.	5 13 A. M.	I, D,		19.	3 27 A. M.
I, D,		4.	11 41 P. M.	I, D,		20.	9 55 P. M.
III, R,		7.	9 2 P. M.	III, D,		22.	2 10 A. M.
II, D,		10.	12 51 A. M.	III, R,		22.	4 56 A. M.
IV, D,		10.	12 51 A. M.	II, D,		24.	6 2 A. M.
IV, R,		10.	2 39 A. M.	I, D,		26.	5 20 A. M.
I, D,		12.	1 34 A. M.	IV, R,		26.	8 25 P. M.
III, D,		14.	10 12 P. M.	I, D,		27.	11 48 P. M.
III, R,		15.	12 59 A. M.	III, D,		29.	6 8 A. M.

MINIMA OF *ALGOL*, P. S. T.

		H. M.			H. M.
Jan.	3.	7 43 A. M.	Jan.	20.	12 36 P. M.
	6.	4 32 A. M.		23.	9 25 A. M.
	9.	1 21 A. M.		26.	6 14 A. M.
	11.	10 10 P. M.		29.	3 3 A. M.
	14.	6 59 P. M.		31.	11 52 P. M.
	17.	3 47 P. M.			

PHASES OF THE MOON, P. S. T.

		H.	M.	
Full Moon,	Feb. 6,	10	24	A. M.
Last Quarter,	Feb. 13,	4	35	P. M.
New Moon,	Feb. 20,	11	41	A. M.
First Quarter,	Feb. 28,	3	13	A. M.

THE SUN.

1898.	R. A. H.	M.	Declination. °	′	Rises. H.	M.		Transits. H.	M.		Sets. H.	M.	
Feb. 1.	21	1	— 17	0	7	13	A.M.	12	14	P.M.	5	15	P.M.
11.	21	41	— 13	55	7	2		12	14		5	26	
21.	22	19	— 10	26	6	50		12	14		5	38	
Mar. 3.	22	57	— 6	42	6	35		12	12		5	49	

MERCURY.

Feb. 1.	19	17	— 21	48	5	48	A.M.	10	30	A.M.	3	12	P.M.
11.	20	12	— 20	57	6	0		10	45		3	30	
21.	21	13	— 18	1	6	10		11	7		4	4	
Mar. 3.	22	18	— 12	53	6	18		11	33		4	48	

VENUS.

Feb. 1.	20	48	— 19	1	7	8	A.M.	12	1	P.M.	4	54	P.M.
11.	21	38	— 15	30	7	6		12	12		5	18	
21.	22	27	— 11	16	7	0		12	21		5	42	
Mar. 3.	23	14	— 6	33	6	50		12	28		6	6	

MARS.

Feb. 1.	19	40	— 22	22	6	13	A.M.	10	53	A.M.	3	33	P.M.
11.	20	12	— 20	58	6	1		10	46		3	31	
21.	20	44	— 19	10	5	47		10	39		3	31	
Mar. 3.	21	16	— 17	3	5	30		10	31		3	32	

JUPITER.

Feb. 1.	12	40	— 2	42	10	3	P.M.	3	54	A.M.	9	45	A.M.
11.	12	38	— 2	30	9	22		3	13		9	4	
21.	12	36	— 2	11	8	39		2	32		8	25	
Mar. 3.	12	32	— 1	47	7	55		1	49		7	43	

SATURN.

Feb. 1.	16	36	— 20	17	3	2	A.M.	7	50	A.M.	12	38	P.M.
11.	16	39	— 20	21	2	26		7	14		12	2	
21.	16	41	— 20	25	1	49		6	36		11	23	A.M.
Mar. 3.	16	43	— 20	26	1	12		5	59		10	46	

URANUS.

Feb. 1.	16	4	— 20	36	2	31	A.M.	7	18	A.M.	12	5	P.M.
11.	16	5	— 20	39	1	53		6	40		11	27	A.M.
21.	16	6	— 20	41	1	14		6	1		10	49	
Mar. 3.	16	6	— 20	42	12	35		5	22		10	9	

NEPTUNE.

1898.	R. A. H. M.	Declination. °	Rises. H. M.	Transits. H. M.	Sets. H. M.
Feb. 1.	5 17	+ 21 42	1 10 P.M.	8 28 P.M.	3 46 A.M.
11.	5 16	+ 21 42	12 30	7 48	3 6
21.	5 16	+ 21 42	11 51 A.M.	7 9	2 27
Mar. 3.	5 16	+ 21 43	11 11	6 29	1 47

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

(Off left-hand limb, as seen in an inverting telescope.)

		H. M.			H. M.
II, D,	Feb. 3.	9 56 P. M.	III, R,	Feb. 19.	8 42 P. M.
I, D,	4.	1 41 A. M.	I, D,	19.	11 56 P. M.
I, D,	5.	8 10 P. M.	I, D,	21.	6 24 P. M.
II, D,	11.	12 32 A. M.	II, D,	25.	5 44 A. M.
I, D,	11.	3 34 A. M.	III, D,	26.	9 58 P. M.
I, D,	12.	10 3 P. M.	I, D,	27.	1 49 A. M.
II, D,	18.	3 8 A. M.	II, D,	28.	7 2 P. M.
I, D,	18.	5 28 A. M.	I, D,	28.	8 17 P. M.

MINIMA OF *ALGOL*, P. S. T.

	H. M.		H. M.
Feb. 3.	8 41 P. M.	Feb. 18.	4 45 A. M.
6.	5 30 P. M.	21.	1 34 A. M.
9.	2 19 P. M.	23.	10 23 P. M.
12.	11 8 A. M.	26.	7 12 P. M.
15.	7 56 A. M.		

COMET *b*, 1897.

BY C. D. PERRINE.

This comet, the second of the year, was discovered by the writer on the evening of October 16th. It was then in the constellation *Camelopardalis*, in R. A. $3^h\ 36^m\ 7^s.58$, Decl. + 66° 46′ 43″.6, at $17^h\ 45^m\ 22^s$, Greenwich M. T. It was then moving north at the rate of about one and a half degrees per day, and west 6^m. On October 29th it passed within about eight degrees of the pole, and is now moving southward.

The following elements have been deduced from the Mt. Hamilton observations of October 16th, 24th, and 31st:—

$$\left.\begin{aligned} T &= 1897\ \text{Dec.}\ 8.84714 \\ \omega &= 66^\circ\ 5'\ 42''.2 \\ \Omega &= 32\ \ 4\ \ 4\ .9 \\ i &= 69\ 37\ 40\ .9 \end{aligned}\right\}\ \text{Ecliptic and mean equinox of 1897.0}$$

$$\log q = 0.132056.$$